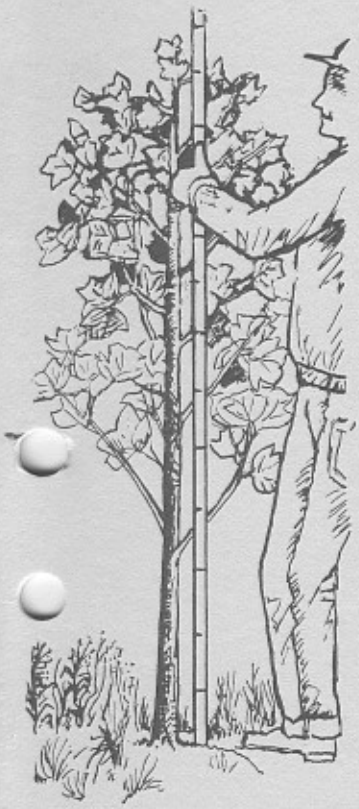

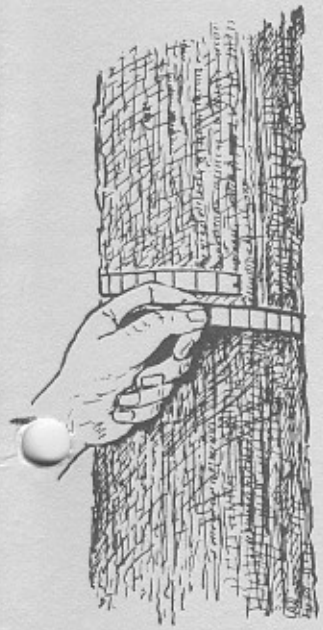

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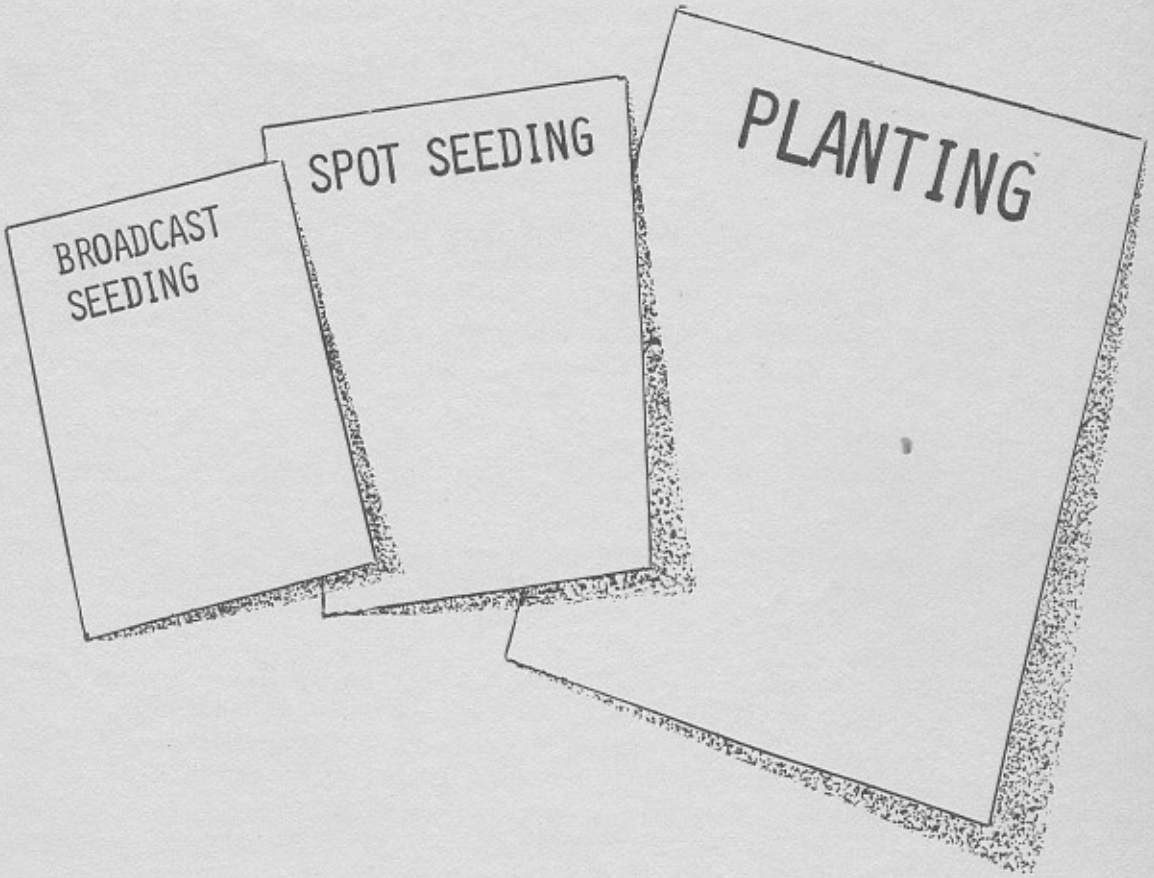

OF LOBLOLLY PINE

Virginia Division of Forestry
Department of Conservation and Economic Development

A COMPARISON OF PLANTING, SPOT SEEDING, AND BROADCAST SEEDING OF LOBLOLLY PINE

by

T. A. Dierauf and J. W. Garner, Jr. *

ABSTRACT

The results of planting, spot seeding, and broadcast seeding of loblolly pine were compared on ten different tracts. Seeding rates were five seeds per spot for spot seeding and one pound per acre for broadcast seeding.

Stocking is highest and most uniform for planting, and lowest and least uniform for broadcast seeding. Planted seedlings have grown considerably faster than direct seeded seedlings. After five seasons, average heights are 11.1, 7.1, and 5.8 feet for planting, spot seeding, and broadcast seeding, respectively.

DESCRIPTION OF STUDY

The following methods of establishing loblolly pine were tested:

1. Planting at a rate of 1,000 seedlings per acre (6.6' x 6.6' spacing).

2. Spot seeding with 5 seeds per spot at a rate of 1,000 spots per acre (6.6' x 6.6' spacing). After dropping 5 seeds in a raked spot, the seeds were lightly stepped into the loosened soil.

3. Broadcast seeding with a cyclone seeder at a rate of 1 pound of seed per acre.

The seed was stratified for 30 days and treated with Endrin and Arasan before sowing.1/

A total of thirty 1/4 acre plots were installed in the north-central Piedmont of Virginia on ten different tracts: a planted, a spot seeded, and a broadcast seeded plot on each tract. Five of the ten tracts had been site prepared by burning only and the other five by drum-chopping followed by burning. The plots were installed between March 18 and April 1, 1968, by foresters of the Charlottesville district of the Virginia Division of Forestry.

* *Chief and Assistant Chief of Applied Forest Research, Virginia Division of Forestry, respectively.*

1/ *Materials and rates of application per 100 pounds of seed:*

Endrin	*50-W*	*2.5 pounds*
Arasan	*75*	*2.4 gallons*
Dow Latex	*512 Sticker*	*12 ounces*
Aluminum flakes		*1.9 ounces*

Although somewhat dry, there were no serious droughts during the 1968 growing season. The average rainfall deficit in Piedmont Virginia for the six months from April through September was about six inches, with about 1/3 of this deficit occurring during the month of September.

The plots were evaluated after the first, third, and fifth growing seasons. The planted and spot seeded plots were evaluated using the central 100 planted and spot seeded spots. The height of each planted seedling was measured. The number of seedlings at each spot was counted and the height of the tallest was measured. The broadcast seeded plots were evaluated using 49 systematically located mil-acre plots to evaluate each 1/4 acre plot. The number of seedlings on each mil-acre plot was counted and the height of the tallest was measured.

RESULTS

The Appendix includes the data for stocking and height after 1,3, and 5 seasons in the field.

Stocking was highest and most uniform among planted plots and lowest and least uniform among broadcast seeded plots, as shown in Table 1.

Table 1. Average Stocking Percent 2/ and Variation Among Plots, by Treatment, After five seasons

Treatment	Average Stocking Percent	Range Among Plots
Planting	85	65 to 95
Spot Seeding	69	50 to 94
Broadcast Seeding	44	20 to 63

In terms of number of seedlings established for the quantity of seed sown, spot seeding was much more efficient than broadcast seeding. After five seasons, there were an average of 30 seedlings per 100 seed sown on the spot seeded plots, and only 4 seedlings per 100 seed sown 3/ on the broadcast seeded plots.

2/ Stocking percent: Planting - Survival percent; Spot Seeding - percent of spots with at least one seedling; Broadcast Seeding - percent of mil-acre sample plots with at least one seedling

3/ Assuming 18,000 seeds per pound.

On the spot seeded plots, little mortality has occurred, as shown in the Appendix. Table 2 shows the distribution of plots by number of seedlings per spot after five seasons. For all ten plots combined, 43 percent of the spots still contain two or more seedlings.

Table 2. Percent of Spots by Number of Seedlings Per Spot, After five seasons.

County	Site Preparation	Number of Seedlings Per Spot						
		0	1	2	3	4	5	Total
		percent						
Amherst	Burn Only	29	33	17	16	4	1	100
Culpeper	Burn Only	40	20	19	14	5	2	100
Fluvanna	Burn Only	12	16	22	22	19	9	100
Louisa	Burn Only	33	28	27	4	5	3	100
Spotsylvania	Burn Only	50	27	15	6	0	2	100
Amherst	Chop and Burn	43	39	10	6	2	0	100
Culpeper	Chop and Burn	28	20	26	16	7	3	100
Fluvanna	Chop and Burn	6	10	23	26	24	11	100
Louisa	Chop and Burn	25	27	24	14	8	2	100
Spotsylvania	Chop and Burn	42	36	17	3	1	1	100
Means		31	26	20	13	7	3	100

Planted seedlings are considerably taller 4/ than spot seeded and broadcast seeded seedlings, as shown in the Appendix and Figure 1. Planted seedlings were 0.6, 2.7, and 4.0 feet taller than spot seeded seedlings after 1, 3, and 5 seasons, respectively. Planted seedlings were 0.7, 3.2, and 5.3 feet taller than broadcast seeded seedlings after 1, 3, and 5 seasons, respectively. 5/

The difference in height between spot seeded and broadcast seeded seedlings is partly due to the way heights were measured. Only the tallest seedling at each spot and on each mil-acre plot was measured. Stocking was better on the spot seeded plots; an average of 2.2 seedlings per seeded spot and 1.8 seedlings per mil-acre plot. Thus, the seedlings measured for height were selected more intensively on the spot seeded plots.

4/ *Average height: Planting - average height based on all seedlings; Spot Seeding - average height based on tallest seedling at each spot; Broadcast Seeding - average height based on tallest seedling on each mil-acre plot.*

5/ *An analysis of variance of mean height at age 5 was made using logarithims of mean height. The value for the missing plot was estimated and the ANOV completed according to the procedure on page 139 of Steele and Torrie's Principles and Procedures of Statistics, 1960. After 5 seasons, planted seedlings were significantly taller than spot seeded seedlings (at the .001 level), and spot seeded seedlings were significantly taller than broadcast seeded seedlings (at the .02 level).*

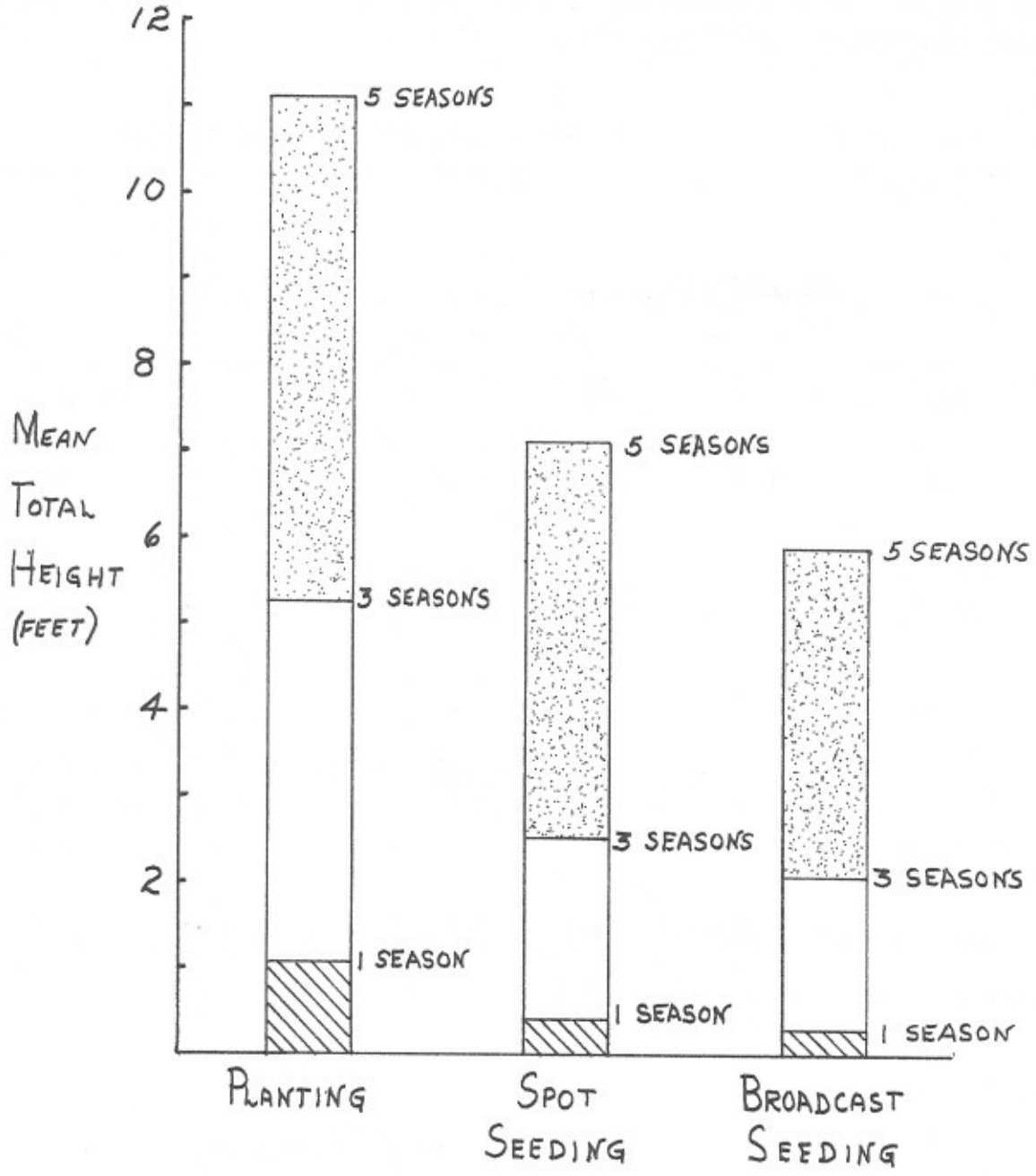

Figure 1. Average height after 1, 3, and 5 seasons for all plots combined. Spot seeding and broadcast seeding heights are based on tallest seedling per spot and mil-acre plot, respectively.

This study was not designed to give a valid estimate of the advantage of chopping and burning over burning alone. The study was designed and installed after site preparation was completed on the tracts used. Tracts that were burned only were not identical to tracts that were chopped prior to burning. Tracts that were chopped prior to burning generally had more brush and less fuel than tracts that were not chopped. It is interesting, however, to compare results for the two methods of site preparation, and this is done in Table 3.

Table 3. Comparison of Results on Burned Only and Chopped and Burned Tracts, After five seasons.

	Burned Only			Chopped and Burned		
Treatment	No. of Seedlings Per Acre	Stocking Percent 6/	Average Height 7/	No. of Seedlings Per Acre	Stocking Percent 6/	Average Height 7/
Planting	806	81	11.2	890	89	11.1
Spot Seeding	1,444	67	7.0	1,560	71	7.3
Broadcast Seeding	799	44	5.7	790	43	6.1

6/ *Ibid., footnote number 2, page 2.*

7/ *Ibid., footnote number 4, page 3.*

APPENDIX

Total number of seedlings per acre, stocking percent 8/ and average heights 9/ After 1, 3, and 5 seasons for all 30 plots.

Treatment	County	Site Preparation	1 Season			3 Seasons			5 Seasons		
			No.	%	Ht.	No.	%	Ht.	No.	%	Ht.
Planting	Amherst	Burn only	710	71	.97	660	66	5.27	650	65	12.41
	Culpeper	Burn only	800	80	.96	790	79	5.48	790	79	11.58
	Fluvanna	Burn only	920	92	1.39	900	90	6.45	900	90	13.37
	Louisa	Burn only	830	83	.94	810	81	4.65	800	80	10.22
	Spotsylvania	Burn only	940	94	.94	890	89	3.98	880	88	8.54
	Amherst	Chop-burn	850	85	.80	840	84	4.62	810	81	8.87
	Culpeper	Chop-burn	930	93	.89	900	90	5.29	900	90	11.81
	Fluvanna	Chop-burn	930	93	1.24	930	93	6.21	930	93	13.43
	Louisa	Chop-burn	960	96	1.20	950	95	5.42	950	95	10.81
	Spotsylvania	Chop-burn	880	88	1.12	870	87	5.06	860	86	10.35
		Means	875	87.5	1.04	854	85.4	5.24	847	84.7	11.14
Spot Seeding	Amherst	Burn only	1,460	74	.27	1,380	71	2.33	1,360	71	7.88
	Culpeper	Burn only	1,440	71	.40	1,290	61	2.02	1,300	60	5.70
	Fluvanna	Burn only	2,690	91	.56	2,500	88	3.21	2,470	88	9.05
	Louisa	Burn only	1,230	65	.32	1,290	68	2.32	1,290	67	6.65
	Spotsylvania	Burn only	1,030	58	.29	840	50	1.95	850	50	5.62
	Amherst	Chop-burn	990	65	.31	850	57	2.11	850	57	5.51
	Culpeper	Chop-burn	1,910	78	.51	1,660	73	3.12	1,630	72	7.84
	Fluvanna	Chop-burn	3,210	96	.45	2,930	94	2.27	2,850	94	8.10
	Louisa	Chop-burn	1,810	80	.57	1,620	76	3.48	1,590	75	9.17
	Spotsylvania	Chop-burn	860	57	.43	860	56	2.17	880	58	5.64
		Means	1,663	73.5	.41	1,522	69.4	2.50	1,507	69.2	7.12
Broadcast Seeding	Amherst	Burn only	470	31	.19	180	18	1.46	245	20	5.06
	Culpeper	Burn only	1,430	67	.38	1,060	59	2.44	1,040	63	6.64
	Fluvanna	Burn only	1,370	61	.39	820	45	2.00	670	43	6.53
	Louisa	Burn only	390	20	.29	490	24	1.98	650	33	4.49
	Spotsylvania	Burn only	1,740	67	.24	1,140	57	1.70	1,390	63	5.60
	Amherst	Chop-burn	240	22	.20	200	16	2.09	260	24	4.90
	Culpeper	Chop-burn	1,220	49	.32	920	33	3.34	590	29	7.36
	Fluvanna	Chop-burn	1,780	76	.29	1,900	71	1.81	1,430	63	6.90
	Louisa	Chop-burn	1,410	63	.51	----------Plot Destroyed----------					
	Spotsylvania	Chop-burn	650	45	.32	710	43	1.97	880	55	5.06
		Means	1,070	50.1	.31	824	40.7	2.09	795	43.7	5.84

8/ *Ibid., footnote number 2, page 2.*

9/ *Ibid., footnote number 4, page 3.*